NOTE

This Microfiche meets the quality requirements of the American National Standard for Microfiche of Documents (ANSI PH5.9-1975). However, because of imperfections in the document from which it was made, it contains images that are illegible or difficult to read. The source document for this microfiche is the best copy that could be obtained prior to filming.

CIS Congressional Information Service Washington, D.C.

S402-11

101st Congress
1st Session } COMMITEE PRINT { S. Prt. 101-63

EARLY HEALTH PROBLEMS OF THE U.S. NUCLEAR WEAPONS INDUSTRY AND THEIR IMPLICATIONS FOR TODAY

REPORT

OF THE

MAJORITY STAFF

OF THE

COMMITTEE ON GOVERNMENTAL AFFAIRS

UNITED STATES SENATE

DECEMBER 1989

Printed for the use of the Committee on Governmental Affairs

U.S. GOVERNMENT PRINTING OFFICE
WASHINGTON : 1989

For sale by the Superintendent of Documents, Congressional Sales Office
U.S. Government Printing Office, Washington, DC 20402

COMMITTEE ON GOVERNMENTAL AFFAIRS

JOHN GLENN, Ohio, *Chairman*

SAM NUNN, Georgia	WILLIAM V. ROTH, Jr., Delaware
CARL LEVIN, Michigan	TED STEVENS, Alaska
JIM SASSER, Tennessee	WILLIAM S. COHEN, Maine
DAVID PRYOR, Arkansas	WARREN B. RUDMAN, New Hampshire
JEFF BINGAMAN, New Mexico	JOHN HEINZ, Pennsylvania
HERBERT KOHL, Wisconsin	PETE WILSON, California
JOSEPH I. LIEBERMAN, Connecticut	

Leonard Weiss, *Staff Director*
Robert Alvarez, *Professional Staff Member*
Jo Anne Barnhart, *Minority Staff Director*
Michal Sue Prosser, *Chief Clerk*

CONTENTS

	Page
Introduction	1
Summary	1
The "Particle Problem"	3
Radioactive Content and Hazard of the Particles	4
The Discovery of Very Small Particles and Wider Contamination	4
Questions About Protective Measures Taken	5
The "Particle Problem" and the AEC's Advisory Committee for Biology and Medicine	6
The Advisory Committee Recommends That Workers Not Be Told of Overexposure	7
The Advisory Committee Recommends Cancer Studies	7
The "Green Run": A Military Experiment	8
The "Particle Problem" Still Remains "A Very Serious Health Problem"	9
A Second Request by the Advisory Committee for Cancer Studies Is Made	9
Problems Continue at Hanford	10
Similar Problems Arise at Other Facilities	11
Implications for Today	11
Early Weapons Workers Show Health Problems	14
Conclusions and Recommendations	15

Introduction

The following report concerns several serious and little known public health problems encountered during the early years of the U.S. nuclear weapons program (1945–1954). The purpose of this report is not only to point out a disturbing chapter in the early history of the nuclear weapons program, but also to show how those past events helped define the course of the U.S. Department of Energy worker health studies. These studies currently involve some 600,000 workers and have the potential for influencing health and environmental policies for millions of Americans.

The part of the report dealing with the 1945–1954 period is based on the personal papers of former government officials, interviews with eye witnesses, and official records obtained from the DOE Archives, the CIC Library in Las Vegas, the National Archives, and historical documents from DOE's Hanford facility.

This report also includes various recommendations to fund needed health studies involving the nuclear weapons program and to make available all DOE material (including archival files) to examine potential health hazards over the past several decades.

Summary

Between 1947 and 1954, high-level Atomic Energy Commission (AEC) officials were made aware of serious public health problems stemming from exposure to highly radioactive particles and gasses emanating from AEC facilities and overexposure of uranium process workers. Exposure data provided to these officials showed that, by the standards of the time, construction workers, military personnel, and guards working outside at the Oak Ridge and Hanford operations as well as workers at AEC uranium plants bore potentially serious health risks.

Radiation risks from stack releases and other sources were sufficiently high for the AEC's Advisory Committee for Biology and Medicine (ACBM) to make two separate recommendations between 1949 and 1951 for the AEC to conduct cancer studies. "Cancer is a specific industrial hazard of the atomic energy business," an ACBM member wrote to the AEC Chairman in 1951. The ACBM's appeals for health studies with respect to exposures from stack releases apparently were not acted upon. During this period the Committee also recommended against informing workers if they exceeded official exposure limits.

Among the most serious problems were those encountered at the Hanford facility in eastern Washington. Significant amounts of long and short-lived radioactive particles and gasses were discharged from plutonium chemical separations stacks between 1945 and 1954.

In March of 1945, Hanford officials became aware that long-lived radioactive particles found offsite in Richland, Washington were coming from Hanford's two plutonium processing plants. Lung doses from plutonium particles, inhaled over a year on the site, may have been over two times higher than the current official lifetime limit for workers. By March of 1948, the radiation health and safety chief at Hanford, commented, in terms of dangers posed to workers, that the particles "can produce radiation damage" and that "the theoretical possibility of injury developing 10 to 15 years from now poses a serious problem."

Beginning on December 2, 1949, the Hanford "T" plant, a plutonium chemical separations facility, deliberately released about 7,780 curies of iodine-131 and 20,000 curies of xenon-113, over a period of 24 to 36 hours. Vegetation was contaminated in milk-producing areas at levels 20 times above the existing standard. The agency which requested this experiment and the exact reason for it remains secret.

Between 1952 and 1954, there were nine major radiation releases from a plutonium processing plant, including 260 Curies of Ruthenium-103 and 106, some of which reached Spokane Washington. The highest levels were onsite where hundreds of military personnel lived and worked. Officials expressed concern about skin exposure, but decided that "nothing was to be gained by informing the public."

Despite efforts to correct these problems, by 1951, a Hanford official warned the AEC's Advisory Committee for Biology and Medicine that the radioactive particle emissions posed "a very serious health problem" and "is present in other AEC manufacturing plants and will be important in new installations not only from the standpoint of real injury but because of the extreme difficulty of defense in cases of litigation."

Unfortunately, this warning has proven to be prophetic. Over the years, this problem has been encountered at several DOE facilities including the Nevada Test Site, the Marshall Islands, the Idaho National Engineering Laboratory, the Rocky Flats Plant in Colorado, and the Fernald Facility in Ohio.

Although high level AEC officials were aware of potentially serious health risks to workers in the early period of the nuclear weapons program, the Atomic Energy Commission and its successor agency, the Department of Energy, have yet to study the health of these and other workers at several sites who may have been exposed to significant environmental radiation releases. In addition to the workers and military personnel at Hanford who were exposed from stack releases in the 1940's and 1950's, workers at the Nevada Test Site the Idaho National Engineering Laboratory and the Savannah River Plant who performed outside work or special clean up jobs are not being studied.

Those DOE worker health studies, which were initiated in 1964, continue to generate controversy and mistrust. These studies have great importance to radiation protection policies because of their potential for influencing exposure standards affecting millions of Americans. However, DOE's dual missions of promoting nuclear technologies and assessing their health impacts have created serious potential for conflict-of-interest. With the growing trend in liti-

gation involving radiation damage claims against DOE and its contractors, this problem can only intensify.

Moreover, a few studies of early nuclear weapons workers that have been done, tend to support official concerns of the 1940's and 1950's over worker health risks. Workers at early uranium processing facilities show elevated risks of dying from cancer and other diseases. Significant excess death rates from leukemia were found among Rocky Flats workers exposed to plutonium. The same study indicates that death rates from all causes increased incrementally with internal doses of plutonium. Also, a recent, but unpublished finding involving a clinical case study of 26 plutonium workers exposed during World War II at the Los Alamos National Laboratory, has discovered a case of osteosarcoma or bone cancer. This represents the first human evidence of bone cancer occurring in a longitudinal clinical study following exposure to plutonium. The estimated internal dose of plutonium to this person is more than three times lower than officially allowed for DOE workers. The risk of an individual from this group contracting this type of cancer, according to a staff interview with the principal investigator, may be 100 times higher than assumed.

Several official groups including a Federal Interagency Task Force on ionizing radiation in 1980, a Centers for Disease Control panel in 1983, and a scientific panel of the state of Colorado in 1984 have expressed concern about DOE's conflict-of-interest between promoting nuclear technologies and assessing their health impacts. Two of the panels recommended that DOE's radiation health effects research be carried out by public health agencies or non-DOE entities.

At the minimum, the federal government should: (a) perform health studies of potential high risk worker and military groups previously excluded from research; (b) encourage a greater role in radiation health effects research by public health agencies and academia; and (c) require DOE to fully disclose its records at all relevant DOE facilities pertaining to past events that may have put the health of workers and the public at risk.

The "Particle Problem"

Between 1945 and 1951, significant quantities of long-lived radioactive particles were found to be leaking from the DOE's Hanford site in eastern Washington. The problem was first discovered in September of 1947 when highly radioactive particles containing radiocerium and plutonium were found on the ground near two plutonium chemical separations facilities (the "T" and "B" plants).[1]

The leak occurred as a result of corroded fan-duct work in the stacks of the two plants and was estimated to have started about six months before it was discovered. A March 1948 report prepared by Dr. Herbert M. Parker, Director of the Hanford Health Instruments Department of the General Electric Company, which ran Hanford for the government, stated that contamination "had been

[1] Parker, H.M., "Review of the Stack Discharge Active Particle Contamination Problem," Health Instruments Department, General Electric Co., Hanford Works, Mar. 22, 1948, p. 4, (HW-9259). This report is referred to in subsequent footnotes as HW-9529.

increasing quite rapidly prior to its discovery." [2] Urgent measures, stated Parker, were taken to "avoid the risk of corrosion to the point of collapse." [3]

Radioactive Content and Hazard of the Particles

Data collected on the particles in October of 1947 indicated that the activity ranged from 0.06 to 1.2 microcuries of total beta activity and from 0.072 to 2.6 nanocuries of total alpha activity per particle. The average activity per particle was 0.77 microcuries of total beta activity and 0.61 nanocuries of total alpha activity. About 50 percent of the beta activity was determined to be from radiocerium and 77 percent of the alpha activity was determined to be from plutonium.[4] In a March 1948 report prepared by Dr. Herbert M. Parker stated that, "specks showing alpha particle have a plutonium to uranium ratio of 20:1." [5] At the time, Parker estimated that an average of about 7.4 billion particles were being released from the two plants per month.[6]

According to Parker "The critical hazard is to the inhalation and lung retention of particles" and that "the available active particles can produce radiation damage." [7] At the time, it was estimated that a worker could be inhaling about 16 radioactive particles per month. Based on the particle data collected in 1947, this suggests that over a year, a worker could have possibly inhaled about 90 nanocuries of plutonium—an amount which is over twice the current official life-time lung burden allowed for DOE workers which was set in 1960.

The Discovery of Very Small Particles and Wider Contamination

Unfortunately, health and safety officials discovered that repair of the defective duct-work did not prevent the discharge of small long-lived particles. According to an internal Hanford memo prepared in 1948, the corroded ducts were responsible for "only a fraction of the total long-lived emissions from the stacks." [8] After replacing the fan ducts, Parker reported "another serious problem" in the form of "ultrafine" particles that were leaking out of the 'T' and 'B' stacks at least since 1945. "Removal of the offending duct work eliminated the large particles, but [had] relatively little influence on the emission of smaller particles." [9]

Moreover, Parker reported that contamination extended to "proposed sites for future expansion." According to Dr. Parker's 1948 report, "It will be noted that depositions in Areas D,E,F,G greatly exceeded the previously reported surface concentration originally defined in zone 3 [the outer boundary area of onsite contamina-

---

[2] HW-9529, p. 4.
[3] HW-9529, p. 5.
[4] Mickelson, M.L., "Preliminary Report on Existing Active Particle Hazard—200 Areas," Oct. 22, 1947, HW-7865.
[5] HW-9529, p. 21.
[6] Atomic Energy Commission, Advisory Committee For Biology and Medicine, Minutes of the Twelfth Meeting, Richland, WA, Oct. 8-9, 1948, U.S.D.O.E. Archives, Germantown, MD.
[7] HW-9529, p. 4.
[8] HW-9529, p. 15.
[9] HW-9529, p. 13.

tion]. There is some evidence that apparent increase of concentration with increasing distance from the stack is real." [10] According to Parker, "If the data [in the outer edge of the contamination zones] are nearly correct, there is a backlog of tens or hundreds of millions of particles unaccounted for in the plant vicinity." [11]

Very small radioactive particles are considered more dangerous because they are too small for the lungs to easily expel and thus can remain in the lung for long periods of time causing damage. This problem was recognized by AEC scientists at the time. By 1948, AEC-sponsored research indicated that toxicity of inhaled radioactive particles increased sharply as particle size decreased below one micron.[12]

It was determined that these very small particles had been routinely released in significant quantities at least since March of 1945, when, according to Parker, offsite measurements in Richland Washington detected "the presence of trace amounts of long-lived fission products. . . " Parker noted that "one of these samples was at least 10 times hotter than average." [13]

Questions About Protective Measures Taken

During the 1940's and early 1950's there were thousands of construction workers on the Hanford site. According to interviews with two officials who were involved in dealing with the particle problem at Hanford, respiratory protection was not provided to construction workers or guards who were further out from the stacks where the small particles were likely to accumulate.[14] [15] The March 1948 report prepared by Dr. Parker, indicates that protective measures were taken, but does not indicate what groups of workers were given respirators.

Apparently after the problem was discovered in September of 1947, some 12,000 respirators were checked with geiger counters, with only four registering the presence of radioactivity. Parker mentions that "undocumented discussions" took place regarding "the feasibility of having all men in the affected areas wear respirators; the reality of the hazard was assayed against the morale damage of suddenly requiring such protection." [16]

According to Parker, "a recommendation to wear respirators in dubious zones" was apparently made. "A cheap disposable unit, the Martindale Protective Mask had been located for this purpose. Although it was recognized that such filters had low efficiency for small particles (1–2 microns), there is no evidence of important activity on the small entities. Plans were made to survey the removed [illegible] at the end of the workday. This protection was applied throughout the T Plant exclusion Area, in agreement with

---

[10] HW-9529, p. 10.
[11] HW-9529, p. 17.
[12] Wilson, H.B. et. al., Journal of Industrial Hygiene and Toxicology, Vol. 30, No. 6, 1948.
[13] HW-9529, p. 26.
[14] Interview (July 17, 1989) with Gene Plock, former G.E. employee involved in developing filtration on the T and B stacks during this period.
[15] Interview with Dr. Carl Gamersfelder (July 19, 1989), former G.E. employee and member of the Hanford Health Instruments Department responsible for performing the site survey of the "particle problem."
[16] HW-9529, p. 13.

the existing survey data. Comfo respirators were required in a smaller specially restricted zone near the stack." [17]

However, Parker was scrupulous to point out that there was very sparse evidence about the actual magnitude and danger of these small particles. According to Parker "long-lived activity has been disseminated as presumed mist or droplets since the start of operation . . . possible radiation damage from these particles is poorly understood." [18]

The task of accurately determining the degree of risk associated with these small particles greatly exceeded the facility's resources. "It will occupy at least 500 man weeks. The current available force is five men; by borrowing manpower from other departments, and by emergency purchase of instruments, the force can hardly be brought to more than 35. A comprehensive survey cannot be recorded in less than three months, by which time the overall picture may have changed completely. Radical corrective measures at the source are clearly indicated." [19]

Parker forcefully stated, "The responsibilities of the [General Electric] Company and of the Commission require the most energetic attempts to prove that no significant radiation hazard can arise from this source or to correct an unsound condition regardless of costs." [20] Parker concluded that "the theoretical possibility of injury developing 10 to 15 years from now poses a serious problem." [21] Unfortunately, the seriousness of the problem remained a major concern at Hanford several years after Parker issued his warning.

The "Particle Problem" and the AEC's Advisory Committee for Biology and Medicine

By 1948, the "particle problem" was brought to the attention of the Atomic Energy Commission's (AEC) Advisory Committee for Biology and Medicine (ACBM). The ACBM was constituted in 1947 as a high level advisory committee to deal with the atomic hazards, biological research and potential uses of atomic energy. The ACBM was staffed by the AEC's Division of Biology and Medicine and had the same status as the AEC's General Advisory Committee. At an October 1948 meeting of the Committee, it was mentioned that "Dr. Parker explained the situation in detail and stated that the first particles found on the ground were quite active according to present standards." [22] The Committee also noted that after the corroded duct was replaced that "smaller particles were left which might actually be a biological hazard."

At the meeting a consultant suggested that radioactive particles would give lung doses ranging between .5 reps and 10 reps per day.[23] An earlier dose estimate by Parker done in March of 1948 suggested that an "order of magnitude" estimate of dose ranged from 130 reps per day to 2,750 reps per day.[24] (A "rep" is an early

[17] HW-9529, p. 14.
[18] HW-9529, p. 30.
[19] HW-9529, p. 11.
[20] HW-9529, p. 17.
[21] HW-9529, p. 29.
[22] Reference No. 6.
[23] Ibid.
[24] HW-9529, p. 32.

expression of dose used during the 1940's and 1950's and is equivalent to 0.83 rad—*r*adiation *a*bsorbed *d*ose.)

Occupational standards for lung exposure to radioactive particles were still being defined at this time. However, the dose estimates presented at the ACBM meeting on this problem clearly indicated a potentially serious health risk. A counter-balancing concern was the perceived need, fueled by Cold War fears, to continue plutonium production because of the relatively small size of the U.S. nuclear arsenal in 1948.

Thus, in this context, the Committee concluded that "there is no scientific evidence that it is an unwarranted hazard to continue the present process for six weeks, during which steps will be taken vigorously to control the hazard." [25]

The Advisory Committee Recommends That Workers Not Be Told of Overexposures

Given the growing concern over potentially serious radiation exposures to workers, the ACBM was presented in December of 1948 with a recommendation by the manager of the AEC's Oak Ridge Operations that workers leaving their employment with the AEC or its contractor be informed if they had exceeded radiation exposure limits; and that medical assistance be provided if a former worker develops a radiation-related illness.[26] (In addition to being informed about potentially serious health risks from "hot" particle emissions at Hanford and Oak Ridge, the Advisory Committee during this period was also informed that hundreds of workers at AEC uranium processing facilities were being excessively exposed to uranium, radium and radon—some at levels 125 times above permissible limits for uranium set during World War II.) [27]

The recommendation was opposed. Instead the Committee recommended that "a terminating employee should be advised at the exit interview as to the care that the AEC utilizes in protecting each employee." [28]

The Advisory Committee Recommends Cancer Studies

Although members of the Advisory Committee opposed informing workers about their radiation exposures, the Committee members nonetheless were concerned about potential risks of workers contracting cancer from exposure to radioactive particles at Hanford and Oak Ridge. At the 14th Meeting of the ACBM held on February 12, 1949, the Committee members discussed the steps being taken to reduce the hazard. Shields Warren, Director of the AEC's Division of Biology and Medicine, told the group that "the problem has been reduced in magnitude but has not been eliminated." [29] Assessing the risks from exposure to radioactive particles

---

[25] Reference No. 6.

[26] Atomic Energy Commission, Advisory Committee for Biology and Medicine, Los Alamos, NM, Dec. 10–11, 1948, U.S.D.O.E. Archives, Germantown, MD.

[27] Atomic Energy Commission, Advisory Committee for Biology and Medicine, Transcript of the Sixteenth Meeting, Washington, DC, June 11, 1949, U.S.D.O.E. Archives, Germantown, MD.

[28] Reference No. 26.

[29] Atomic Energy Commission, Advisory Committee for Biology and Medicine, Transcript—Minutes, 14th Meeting of the Advisory Committee for Biology and Medicine, Feb. 12, 1949, U.S.D.O.E. Archives, Germantown, MD.

released at Oak Ridge and Hanford, commented the Committee Vice Chairman, Dr. Ernest Goodpasture "wouldn't be solved by animal experiments . . . I think that [if] we can learn about bronchial and pulmonary carcinoma [cancer] in general the better off we'll be in this particular field as far as humans are concerned." [30] Goodpasture then recommended that the AEC should be "supporting some research in the causative factors in pulmonary and bronchial carcinoma." [31] ACBM Chairman Dr. Allen Gregg added, "I think [if] this study of cancer of the lung represents and bears on the particle problem and bears on the health [of humans] as it obviously does, then it might be really useful for Dr. Warren to have specific support in using some of that cancer money in that research." [32]

Shortly after the ACBM's meeting in February 1949, Gregg, in a memorandum to the General Manager of the AEC, stated that "in connection with the particle problem the Committee unanimously recommended that it would be desirable to use [the AEC's] cancer research funds for study of cancer of the lung." [33]

In reply to this request AEC Chairman David Lilienthal wrote to Dr. Allen Gregg, Chairman of the ACBM, on April 8, 1949, "The Division of Biology and Medicine and the Division of Engineering are giving continuing attention to the particle problem. A recent report shows that the installation of filters at Oak Ridge has produced satisfactory results on the problem arising from the pile stack." [34] Mention of lung cancer studies in wake of the "particle problem" was conspicuous by its absence.

The "Green Run": A Military Experiment

On December 2, 1949, Hanford officials deliberately released from the stack of the "T" plant, about 7,780 curies of iodine-131, and 20,000 curies of xenon-133, as part of an experiment requested for military reasons.[35] According to the report on this experiment, known as the "green run," "One ton of irradiated uranium with fifteen days of cooling was dissolved from a two ton batch loaded into a clean dissolver." [36] It appeared that officials of the General Electric Co., which operated the Hanford site for the AEC, initially balked at the plan, but they were urged to carry it out by the Air Force.[37]

While the agency requesting the experiment and its exact purpose still remain secret, the military's involvement in it was quite apparent. Base line aerial monitoring by the Air Force was done.

---

[30] Ibid.
[31] Ibid.
[32] Ibid.
[33] Atomic Energy Commission, Advisory Committee For Biology and Medicine, Memorandum to: Carrol L. Wilson, General Manager, From: Allan Gregg, Chairman, ACBMN, Re: Report of Meeting of Advisory Committee for Biology and Medicine, Washington, D.C. February 12, 1949, (no date), U.S.D.O.E. Archives, Germantown, MD.
[34] Lilienthal, D., Letter to: Allen Gregg, Apr. 8, 1949, U.S. National Archives, AEC Records, RG 326, Lilienthal Files, Washington, DC.
[35] Jenne, D.E. and Healy, J.E., "Dissolving of Twenty Day Metal at Hanford, Development Division and Health Instrument Divisions, General Electric Co., (HW-17381) Hanford Works, May 1, 1950. (This report is referred to in subsequent footnotes as "HW-17381.")
[36] HW-17381, p. 3.
[37] HW-17381, p. 7.

Also "weapons carriers" for field monitoring were deployed as part of a military exercise. [38]

Immediately after the experiment began, plans went awry. The weather shifted, resulting in unplanned and excessive spread of radioactivity—a reason why G.E. may have been reluctant to go ahead. Contamination exceeded 4,000,000 pci/kg which was 20 times the "tolerence level" set at the time. The plume caused significant contamination offsite in Pasco, Walla Walla and Spokane Washington. Monitoring equipment failed and the monitoring laboratory became contaminated from the plume—making it difficult to evaluate environmental samples. Morever, two to three times more radioactivity escaped than expected. [39]

The "Particle Problem" Still Remains "A Very Serious Health Problem"

By January of 1951, the "particle" problem was still a matter of great concern at Hanford. A little more than two years earlier the Committee had recommended against shutting down the "T" and "B" plants for at least a six-week period during which corrective measures would be taken. Apparently, the plants kept operating while Hanford technicians still failed to capture potentially dangerous radioactive particles.

According to a transcript of a meeting of the ACBM held on January 12, 1951, a Hanford official stated: "At the time [October, 1948] our principal concern was with the radioactive particle problem. Sand filters were then in operation but numerous fine particles in the dissolver off gasses were bypassing these filters. This condition has only recently been corrected by the installation of glass fibre filters. Active iodine is now removed from the stack gasses chemically. The particle problem still remains, in my opinion, a very serious health problem. This problem is present in other A.E.C. manufacturing plants and will be important in new installations not only from the standpoint of real injury but because of the extreme difficulty of defense in cases of litigation." [40]

A Second Request by the Advisory Committee for Cancer Studies Is Made

The potential of workers and members of the public contracting radiation-induced cancer from the operation of government nuclear facilities remained an important concern of the ACBM. This concern was underscored in a December 4, 1951 letter to Gordon Dean, Chairman of the AEC from Dr. Earnest W. Goodpasture, Vice Chairman of the ACBM. *Cancer is a specific industrial hazard of the atomic energy business."* [emphasis added] Goodpasture wrote: "This significant fact justifies, in the opinion of the Committee, the continued exploitation of the Commission's special facilities for ra-

---

[38] Conklin, A.W., "Review of the Green Run Document "Dissolving of Twenty Day Metal at Hanford,' ", State of Washington, Department of Social and Health Services, May 8, 1989 (This report is referred to in subsequent footnotes as "Green Run Report.")

[39] Green Run Report, pp. 2-3.

[40] Atomic Energy Commission, Advisory Committee For Biology and Medicine, Notes, Jan. 12, 1951, U.S.D.O.E. Archives, Germantown, MD.

diation cancer research, diagnosis and therapy. The Committee recommends the cancer program be vigorously pursued as a humanitarian duty to the nation." [41]

AEC Chairman Dean, in a draft letter to Dr. Goodpasture, dated December 19, 1951, avoided the ACBM's request for radiation cancer research studies of workers and instead stated: "We are reminded, too, that in juxtaposition to the very radiation which can contribute to cancerous reactions in living tissue, radioisotopes and controlled irradiation with neutrons hold promise of being among the most effective means yet devised for the study and treatment of cancer." [42] It is not known if this letter was sent.

Problems Continue at Hanford

The startup of a third plutonium chemcial separations plant called "Redox" (*Red*uction *Ox*idation) at Hanford in 1952 also added to the continuing "particle problem." Between 1952 and 1954, the Redox facility experienced at least nine major releases, including a 260 Ci release of Ruethenium 103 and 106. Radiation dose rates near the redox stacks measured up to 16 rad/hr in flakes that were several inches long.[43] At the time there were hundreds of military personnel living on site, some who were called upon to decontaminate areas near the stack.

While the radioactive particles reached Spokane, WA, according to a report on this event by the Washington State Department of Social and Health Service (DSHS), AEC contractor officials decided that "nothing was to be gained by informing the public." [44] The DSHS report also noted that "possible localized necrosis [tissue death] could be expected from prolonged exposure" along with a small chance of contracting lung cancer. Although Hanford continued to have problems with stack releases since the beginning of startup in 1945, major questions about the actual hazards posed by inhalation of radioactive particles remained unanswered. In a September 1954 General Electric Co. Report on the ruethenium release problem, Herbert Parker stated, "The remote possibility of tumor induction was implied on our reservations on the effects of insolvable particles. This point was raised on o ur first 'particle problem' six years ago. There has been little experimental progress to date on this point. The present particles do not have specific activity as high as those encountered on other problems." [45]

In December of 1954, Hanford's stack release problems were brought up by Dr. John Bugher, Director of the AEC's Division of Biology and Medicine at the 47th meeting of the Advisory Committee For Biology and Medicine. The discussion was concerned with strontium-90 measurements and Dr. Bugher mentioned, "We've

---

[41] Goodpasture, E.W., Letter to: Gordon Dean, Chairman of the Atomic Energy Commission, Dec. 1, 1951, U.S.D.O.E. Archives, Germantown, MD.

[42] Atomic Energy Commission, Draft Letter To the Vice Chairman, Advisory Committee For Biology and Medicine, Dec. 19, 1949, U.S.S.O.E. Archives, Germantown, MD.

[43] Conklin, A.W., "Overview of Historical Documents," State of Washington, Department of Health and Social Services, Sept. 22, 1986. (This report is referred to in subsequent footnotes as "Overview Report.")

[44] Overview Report, p. 4.

[45] Parker, H.M. "Status of Ground Contamination Problem," General Electric Co., Hanford Works, HW-33068, Sept. 15, 1954.

been fully aware that from a chemical separations plant, they make major problems out there. . . ." [46]

Similar Problems Arise at Other Facilities

The warning made to the AEC's Advisory Committee, in January, 1951, by the Hanford Official that the environmental release of radioactive particles "is present in other AEC manufacturing plants and will be important in new installations" has proven to be prophetic. For example:

Atmospheric nuclear weapons tests in the South Pacific and Nevada have created a long, bitter legacy of contamination, disease and both scientific and political controversy.

Fires at DOE's Rocky Flats facility have led to offsite plutonium contamination and increased worker exposures—a problem that has led to costly litigation and deepening mistrust by the public.

Large uranium releases at DOE's Fernald facility in Ohio have led to costly litigation and public fears surrounding uncertainties over health risks.

Large releases of radioiodine and other elements at DOE's Idaho National Engineering Laboratory in the late 1950's and early 1960's have prompted the DOE to launch a dose reconstruction study.

Implications for Today

For more than 10 years, DOE's occupational epidemiological research program, known as the Health and Morality Study, has been fraught with controversy. The Health and Mortality study was initiated in 1964, when the AEC awarded a contract to Dr. Thomas F. Mancuso of the University of Pittsburgh. At the time Mancuso had been given a career award by the National Cancer Institute as one of America's top researchers.

The AEC's reason for launching health studies of federal radiation workers in 1964 appeared to be somewhat different from those of the AEC's Advisory Committee For Biology and Medicine in 1949 and 1951. Instead of being concerned over potentially serious health risks, an AEC advisor who recommended this study indicated that, "much of the motivation for starting this study arose from the 'political' need for assurance that AEC employees are not suffering harmful effects." [47]

In 1974, the AEC decided to terminate Mancuso's contract by 1977, after he would not cooperate in publicly downgrading a study done that summer by the Washington State Department of Social and Health Service (DSHS). The DSHS study found excess cancer deaths among Hanford workers. A year earlier, Mancuso's AEC project officer who eventually helped orchestrate Mancuso's firing, wrote "unless an immediate replacement [for Mancuso] is found, a

---

[46] Atomic Energy Commission, Advisory Committee For Biology And Medicine, Transcript, 47th Meeting, Dec. 3, 4, 1954, Washington, DC, U.S.D.O.E. Archives, Germantown, MD., P. 58.

[47] MacMahon, B., Letter to: Leonard Sagan, U.S.A.E.C., Division of Biology and Medicine, Nov. 8, 1967, U.S. Department of Energy Research Program, Washington, DC.

public charge may be made that the AEC is stopping the program out of fear that positive findings will emerge." [48]

A Congressional investigation by the House Interstate and Foreign Commerce Subcommittee on Health and the Environment later discovered that this same official was awarded the contract, initially held by Mancuso, to study Hanford workers after leaving his AEC employment to work for Battelle Pacific Northwest Laboratory.[49] In May of 1978, the Chairman, Rep. Paul Rogers and Ranking Minority Member, Rep. Tim Lee Carter, of the Subcommittee found that official reasons for firing Mancuso were "not supported" and the decision to transfer Mancuso's study was "highly questionable at best." The whole process, Rogers and Carter concluded, indicated "serious mismanagement and is of highly questionable legality." [50]

By 1977, Mancuso's contract ended with his colleagues, Dr. Alice M. Stewart and George W. Kneale, reporting that Hanford process workers may have risks of dying from radiation-induced cancer that are 10 to 20 times greater than current protection standards assume.[51] These findings prompted a firestorm of controversy, fed largely by DOE circulating Mancuso's Hanford data to several critics without his knowledge. Eventually, Battelle Pacific Northwest Laboratory (PNL) became the principle critic of Mancuso, et al. over the last several years.

In 1979, because of concern over excessive use of medical radiation, the handling of the Mancuso controversy and Congressional revelations about atmospheric nuclear weapons tests, a Federal Interagency Task Force on Ionizing Radiation was established. In 1980, the Task Force concluded that DOE maintains a virtual monopoly over funding of federal radiation health effects research; and that DOE had a potential conflict-of-interest between its dual missions of developing radiation technologies and assessing their health impacts. Then Secretary of the Department of Health, Education and Welfare, Joseph Califano proposed removing the radiation health effects research from DOE's control.

Since the late 1970's, the controversy over DOE's radiation health effects research program has persisted.

In 1979, an NRC contractor reported that DOE was circulating a flawed and dubious version of the data on Hanford workers to several critics paid by DOE to criticize the Mancuso, Stewart, and Kneale findings without the knowledge or consent of Dr. Mancuso.[52]

---

[48] Marks, S., Memorandum (Draft), U.S.A.E.C. Division of Biology and Medicine, Feb. 20, 1973, U.S. House of Representatives, Energy and Commerce Subcommittee on Health and the Environment, Washington, DC.

[49] U.S. Congress, House Committee on Interstate and Foreign Commerce, Subcommittee on Health and the Environment, "Effect of Radiation on Human Health," 95th Congress, 2d Session Jan. 24-26, February 8, 9, 14, and 28, 1978, Serial No. 95-179, Volumes I and II, U.S. Government Printing Office, Washington, DC.

[50] Rogers, P. and Carter T.L., U.S. Representatives, Letter to: James Schlesinger, Secretary of Energy, May 4, 1978, U.S. House of Representatives, Energy and Commerce Subcommittee on Health and the Environment, Washington, DC.

[51] Mancuso, T.F., Stewart, A.M. and Kneale, G.W., "Radiation Exposures of Hanford Workers Dying from Cancer and Other Causes," Journal of Health Physics, 33, No. 5 (November 1977): 369-384.

[52] Redmond, R., Klimko L.A., and Friedman, K., "Health Effects of Low Level Ionizing Radiation," Final Report to the U.S. Nuclear Regulatory Commission, NRC-01-78-011, January

Continued

In 1982, a DOE contractor presented findings on Rocky Flats workers in a manner that misrepresented the study by obscuring an excess death rate from brain tumors. A scientific panel convened by the state of Colorado subsequently recommended that this study be transferred to the National Institute of Occupational Safety and Health.[53]

In 1983, a Centers for Disease Control Panel learned that the DuPont Co. had found that Savannah River Plant workers were experiencing excess leukemias. DOE was made aware of the Dupont findings in 1976, but only initiated their own study in 1983 after the CDC panel members discovered the problem. The panel found that DuPont's efforts to use a statistical method that erased the excess leukemias was "innappropriate" and recommended that a non-DOE group analyze this data.[54]

In 1984, an official publication of Oak Ridge National Laboratory claimed, with respect to health studies of laboratory workers, that it was safer to work at the laboratory than to stay at home.[55] In fact, an unpublished study of over 20,000 lab workers found increased risks of dying from all cancers following radiation exposure.[56] A second study of about 8,000 workers, which was eventually published found an increased death rate from leukemia.[57]

In 1988, consultants to the people of Rongelap in the Marshall Islands discovered that DOE had found plutonium in urine samples of the Marshall Island people in 1973. During the 1950's the U.S. tested nuclear weapons in the Marshall islands creating widespread radioactive contamination. Between 1973 and 1988, DOE did not attempt to adequately clarify this disturbing finding and did not inform the Marshall Islands people of this problem.[58]

Adding to the growing public mistrust has been DOE's reluctance to study potential high risk workers. For instance, construction workers involved in radioactive maintenence and clean up work at various sites are not being studied. At DOE's Savannah River plant thousands of construction workers have been used over the years for maintenence, repair of contaminated equipment and clean up of highly radioactive areas.

At DOE's Idaho National Engineering Laboratory some 1,800 people were involved in the clean up of the SL–1 reactor accident in 1961. The accident resulted in two deaths and very serious contamination. Secretary Watkins, has agreed about the need to study

---

1979, Kinetics Research Inc., Madison WI. The Report concluded that the data provided on the Hanford workers from DOE "is not a consistent, reliable and authentic representation of the true facts concerning the mortality and exposure experience of Hanford workers. In particular, the data does not represent the reported state of the data maintained at its most reliable source."

[53] The State of Colorado, Governor's Science and Technology Advisory Council, "Report on the Rocky Flats Employees Study," Final Report, Mar. 21, 1984.

[54] U.S. Department of Energy, "Epidemiologic Projects Considered Possible to Undertake in Populations Around the Savannah River Plant, provided by Epidemiology Consultants to the U.S. Centers for Disease Control, Oct. 25, 26, 1983, U.S.D.O.E., Office of Health and Environmental Research, Washington, DC.

[55] Postma, H., "Editorial," The Oak Ridge National Laboratory Review, No. 1, 1984, p. 1.

[56] Abd Elghany, N., "An Epidemiological Study of Cancer Mortality Among Workers Exposed to Occupational Low Levels of Ionizing Radiation," Dissertation, 1983, Department of Epidemiology, University of North Carolina, Chapel, Hill, NC.

[57] Checkoway, H. et al., "Radiation, work experience and cause-specific mortality among workers at an energy research laboratory, British Journal of Industrial Medicine, 42:525–533.

[58] Franke, B., "Is Rongelap Atoll Safe?," paper prepared for a meeting with the U.S.D.O.E., Mar. 3, 1989.

Nevada Test Site and INEL workers, but no specific study plans have been developed at this time.

Early Weapons Workers Show Health Problems

While the health of several large groups of workers are not being researched, a few DOE-sponsored studies tend to support the official views held during the early period of the nuclear weapons program; that workers were being excessive exposed and bore potentially significant health risks. As mentioned earlier in this report, the AEC's Advisory Committee for Biology and Medicine was informed in 1948 that workers at uranium processing plants were being exposed to excessive levels of uranium dust. In 1982, a study of 30-year lung doses to workers at a DOE uranium processing plant operated at the Oak Ridge site between 1943 and 1947, indicate "some workers may have received lung doses as high as several hundred rem." [59]

Moreover, an epidemiological study indicates this group of Oak Ridge workers bear a significantly elevated risk of dying from lung cancer following exposure to uranium, after smoking habits were factored in.[60] A second study shows that workers at an early uranium processing facility near Buffalo, New York are experiencing significantly high death rates for all causes. Deaths from laryngeal cancer and respiratory disease were especially pronounced.[61]

In terms of risks from the assimilation of plutonium, a 1987 study of workers at DOE's Rocky Flats facility indicate that deaths from all causes, all cancers and digestive cancers increased with increasing internal exposures to plutonium. Excess deaths from leukemia were found among Rocky Flats workers exposed to plutonium.[62] A more recent study involving a clinical-case study of 26 workers considered to be the most heavily exposed to plutonium at Los Alamos during World War II, also supports official concerns about worker risks during the 1940's and 1950's. This study has recently uncovered a case of osteosarcoma (bone cancer)—a type of cancer previously linked to radium exposure. According to a staff interview with the study investigator, the estimated body burden of plutonium for the person with this cancer is about 13 nanocuries—about three times less than official life-time limit for workers. This finding suggests that the risk of an individual in this group contracting this cancer may be 100 times higher than assumed.[63]

---

[59] Polednak, A.P., Keane, A.T., and Beck, W.L., "Estimation of Radiation Dosed to the Lungs of Early Uranium Processing Plant Workers," Environmental Research, 28, 313-328, (1982).

[60] Cookfair, D.L., Beck, W.L., Shy, C., Lushbaugh, C.C. and Sowder, C.L., "Lung Cancer Among Workers at A Uranium Processing Plant," U.S. Department of Energy, Office of Health and Environmental Research, Washington, DC.

[61] Dupree, E.A., Cragle, D.L., McLain, R.W., Crawford-Brown, D.J., Teta, M., "Mortality Among Workers at a Uranium Processing Facility, the Linde Air Products Company Ceramics Plant, 1943-1949," Scandinavian Journal of Work, and Environmental Health, 13, (1987), 100-107.

[62] Wilkinson, G.S., Teitjen, G.L., Wiggs, L.D., Galke, W.A., Acquavella, J.F., Reyes, M. Voelz, G.L. and Waxweiler, R.J., "Mortality Among Plutonium and Other Radiation Workers at a Plutonium Weapons Facility," American Journal of Epidemiology, 125. No. 2., (1987).

[63] Interview with George L. Voelz, July 27, 1989.

Conclusions and Recommendations

There needs to be a comprehensive evaluation of DOE's historical records and the agency's radiation health effects research program with respect to DOE's environmental, safety and health policies.

Currently, there is very little connection between DOE's radiation health effects research program and the development of E, S, and H policy. Secretary Watkins' plan to have DOE's Office of Environment, Safety and Health assume greater responsibility over DOE's radiation health effects research activities is a good step in the right direction.

It appears that the agency's long-standing concern over liability has been a significant force in shaping this area of research. For example, DOE's reluctance to study the long-term health effects of workers at the Nevada Test Site may be influenced by the fact that the workers' compensation program for test site workers in Nevada was declared invalid by a Federal appeals court in 1984. It was discovered that the state had a secret agreement with the DOE and its predecessor, the AEC since the early 1950's, allowing the DOE to decide on radiation compensation claims filed by test site workers or their survivors. Unfortunately, this concern over liability will continue to play a major role because of the trend in litigation against the DOE.

Because of this continuing perception of DOE's conflict-of-interest, it is important that other public health agencies and academic institutions have a greater role in radiation health effects research. An out-of-court settlement of a civil class action lawsuit, after the Three Mile Island nuclear accident, has established a research fund with this in mind. Similarly, the recent agreement by the DOE to settle a class action lawsuit pertaining to radiation releases at DOE's Fernald facility, in Ohio, will include a research fund for independent research on radiation health effects. DOE's reluctance to provide occupational epidemiological data to the Three Mile Island Public Health Fund, raises questions about DOE's cooperation with the proposed fund to be set up as part of the Fernald settlement.

Also, the National Institutes of Occupational Safety and Health and the Centers for Disease Control have been given greater research responsibilities regarding the radiological impacts of DOE activities. At minimum, the DOE's radiation health effects research should be subject to a rigorous outside review involving public health agencies and academia.

Finally, the DOE should make public all relevant information regarding events at DOE sites that may have placed the health of workers and the public at risk. A good model for this is the data respository established by DOE in the late 1970's in Las Vegas regarding nuclear weapons testing.

Good places to start are at DOE's Hanford, Idaho National Engineering Laboratory and Rocky Flats facilities where health-related studies have been initiated. DOE's Operations Office Manager of the Hanford site requested this February that DOE's Defense Program Headquarter's Office declassify and make public all other relevant documents about radiation releases at Hanford. To date, no

action has been taken. Because the DOE is providing funds for the State of Colorado to assess health impacts of the Rocky Flats facility, the release of documents concerning radiological releases would help this effort.

○